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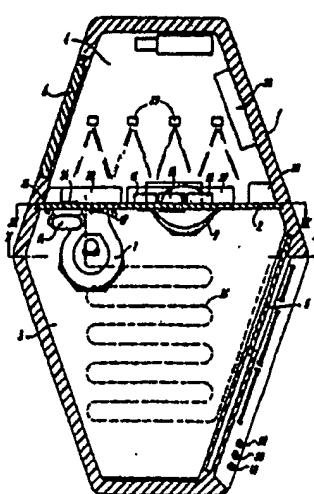
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㉚ Toilet for public use.

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⑦ A public convenience comprises a cabin (1) which is divided by a partition (2) into a usage cubicle (3) having a door (5) to be locked from the inside, and an equipment cubicle (4), a toilet bowl (7) being placed in the usage cubicle, this toilet bowl being provided with a flushing device (11) which is connected to a fluid-carrying line and in which is mounted a regulating valve (20a) which can be opened and closed by control means. In order to be able to keep the toilet very clean under all circumstances and to minimise the susceptibility to vandalism, a number of nozzles (18, 19; 25, 26) for cleaning the edge of the toilet bowl and/or the floor of the usage cubicle open into the usage cubicle these nozzles being connected to fluid-carrying lines having regulating valves (20b, 20c) which can be opened and closed by control means. First detection means (29) such as radar or infrared beams, which are not accessible from the usage cubicle and which can detect the presence and absence of a subject in the usage cubicle, are placed in the equipment cubicle. The detection means are connected to the con-

trol means, all this such that the valves (20b, 20c) in the fluid-carrying lines to the nozzles (18, 19; 25, 26) can be opened only if it is detected that somebody has been present in the usage cubicle and has left the latter. Fig-1



## Toilet for public use.

The invention relates to a toilet for public use, comprising a cabin which is divided by a partition into a usage cubicle having a door to be locked from the inside and an equipment cubicle, a toilet bowl being placed in the usage cubicle, which toilet bowl is provided with a flushing device connected to a fluid-carrying line in which is mounted a regulating valve which can be opened and closed by control means.

Such public toilet cabins for use by men and women are erected in a number of large European cities. They are made of concrete. The toilet bowl is flushed and cleaned by being folded away, after use, into the equipment cubicle, where it is cleaned and subsequently folded back into the use position. The hinge and operating mechanism necessary for this purpose is vulnerable and unsafe. Furthermore, keeping the floor and/or the toilet bowl edge clean leaves a lot to be desired.

The invention aims at avoiding these drawbacks and at providing a toilet, mentioned in the introduction, which can be kept very clean completely automatically without a vulnerable hinge and operating mechanism being necessary, the structure being hardly susceptible to vandalism, if at all.

According to the invention the toilet is characterized for this purpose in that a number of nozzles for cleaning the toilet bowl edge and/or the floor of the usage cubicle open into the usage cubicle, these nozzles being connected to fluid-carrying lines having regulating valves which can be opened and closed by control means, and in that first detection means such as radar or infrared beams which are not accessible from the usage cubicle and can detect the presence and absence of a subject in the usage cubicle are placed in the equipment cubicle, these detection means being connected to the control means, all this being such that the valves in the fluid-carrying lines to the nozzles can be opened only if it is detected that somebody has been present in the usage cubicle and has left the latter.

The bowl edge is, for example, cleaned once after each use and the floor is cleaned once after every third use. This latter figure is to be adjusted to suit the requirements.

The successive detection of the presence and absence of a subject and the subsequent automatic cleaning of parts susceptible to contamination, in particular the edge of the toilet bowl and/or the floor, are essential to the inventive concept. The upper edge of the toilet bowl will usually need to be cleaned after each use.

The possibility is not excluded that some delay

occurs in the operation of the valves in the fluid-carrying lines to the nozzles for cleaning the toilet bowl and of the valves in the fluid-carrying lines to the nozzles for cleaning the floor, all this such that, for example, first the toilet bowl edge and subsequently the floor will be cleaned.

It must be ensured during flushing that nobody enters the usage cubicle. Use is therefore preferably made of a door-locking mechanism connected to the control means, all this such that the locking mechanism is brought into the locked position if it is detected that somebody has been present in the usage cubicle and has left the latter. Locking of the door-locking mechanism will be a condition for opening the valves in the fluid-carrying lines to the cleaning nozzles.

The bowl must always be flushed after use. Second detection means which are not accessible from the usage cubicle, are connected to the control means and can detect the presence of a hand, foot or the like near a given part of the wall or floor, are present in the equipment cubicle, all this such that the valve in the fluid-carrying line of the flushing device of the toilet bowl is opened if the second detection means have detected the presence of a hand, foot or the like near the said wall part.

If flushing is not carried out by bringing a hand, foot or the like near a given part of the wall or floor, flushing is nevertheless necessary. For this reason the control means will open the valve in the fluid-carrying line of the flushing device if it is detected that somebody has been present in the usage cubicle and has left the latter without having operated the second detection means.

After use, flushing is always preferably carried out twice; for example by the control means opening the valve in the fluid-carrying line of the flushing device of the toilet bowl during each locking of the door-locking mechanism by a subject entering the usage cubicle.

In order to prevent the cabin from smelling as a consequence of the fact that the pores become saturated with salt which, because of their hygroscopic nature, remain moist and spread smell the cabin walls and the partition should consist of a non-porous, corrosion-resistant material. The cabin walls and the partition preferably consist of a sandwich formed from a core of plastic foam covered on either side with a hard smooth layer of polyester and/or polyurethane.

When the toilet bowl forms an integral with the partition and has no moving parts it will be extremely difficult for malevolent subjects to damage the bowl.

The floor of the usage cubicle and the toilet

bowl edge will have to be dried after cleaning. For this purpose the toilet will be provided with means for supplying warm air to the toilet bowl edge or, as the case may be, floor of the usage cubicle, control means being present for activating the warm air supply means when the cleaning of the toilet bowl edge or, as the case may be, usage cubicle floor is finished.

In order to be able to wash the hands, the toilet is provided with a wash basin, a water-supply nozzles near the wash basin, means, fitted in the equipment cubicle, for the supply of water to said nozzle, detection means for detecting a hand near said nozzle and activating the said water supply if the presence of a hand is detected.

A soap dispenser is preferably placed in the vicinity of the wash basin.

Damage to the toilet-paper holder can be avoided by placing the latter into the equipment cubicle, an opening for feeding through the paper being recessed in the partition.

In order to make the temperature in the toilet cubicle bearable in cold weather an air-heating unit may be fitted in the equipment cubicle and air vents may be recessed in the partition, a fan being present for blowing air around the heating unit via the air vents into the usage cubicle and use being made of a thermostat control for switching on the air-heating unit at a certain air temperature.

It is also possible for a floor-heating system controlled by a thermostat to be added.

In order to inform those who want to use the toilet of whether the toilet is vacant or engaged or equally that they have to wait because the toilet bowl edge and/or the floor have been cleaned, illuminated indicating elements are arranged near the door of the usage cubicle.

It is pointed out that U.S. Patent 2,688,141 describes a cabin provided with an entrance door, which cabin accommodates a toilet having an automatic flushing system. Flushing valves are operated automatically at a certain time after entry of a subject. There are switches for detecting whether the door is open or closed. However, the presence of a subject in the cabin is not detected.

U.S. Patent 4,233,692 furthermore describes a toilet for public use, having a toilet bowl which forms an integral with the wall. There are nozzles for supplying water and cleansing agents. Electromagnetic valves in the lines are operated by fairly sensitive pushbuttons. Again, the presence of a subject is not detected.

The invention will now be explained in detail by reference to the figures which represent an exemplary embodiment.

Figure 1 shows a horizontal section through the toilet cabin.

Figure 2 shows a section along line II-II in Figure 1.

Figure 3 shows a view along line III-III in Figure 1.

5 The public convenience shown comprises a hexagonal cabin 1, the walls, floor and roof of which are manufactured of corrosion-resistant, strong material. A sandwich of a layer of plastic foam (for example 8 cm thick polyurethane foam) covered on two sides with a smooth hard layer of polyester and/or polyurethane is particularly suitable. The cabin is divided by a partition 2 of the same material into two cubicles: a usage cubicle 3 and an equipment cubicle 4. The two cubicles have an entrance door 5 and 6, respectively. The door 5 of the usage cubicle is a sliding door lockable from the inside, while the door 6 of the equipment cubicle is a hinged door which is hardly recognisable from the outside and can be opened only by an authorized fitter or the like.

10 The following articles are arranged in the usage cubicle: a toilet bowl 7 which forms an integral with the partition 2 and has no moving parts, a self-closing rubbish bin 8, a wash basin 9 having a cold-water tap 10, a soap dispenser 12, a hand dryer 13 and a clothes-peg 14. A hand support may be formed at the wall near the toilet bowl for the disabled. Furthermore, a slit 15 through which toilet paper can be dispensed by a holder 16 arranged on the rear surface of the wall 2, is arranged in the wall 2.

15 A flushing device 11 connected to a fluid-carrying line in which a magnetic valve 20a is housed, is present near the toilet bowl 7.

20 For cleaning the upper edge of the toilet bowl 7 three sets of nozzles are arranged above the toilet bowl 7, each set comprising a nozzle 18 for spraying water and a nozzle 19 for spraying cleansing agent. These nozzles are connected to lines in which the flow is controlled by a magnetic valve 20b.

25 A slit 21 which is connected to a box 22 for hot air fastened to the rear surface of the wall, is present in the wall 2 above the nozzles 18, 19.

30 A number of sets of nozzles is arranged near the floor, each set comprising a nozzle 25 for spraying water and a nozzle 26 for spraying chemical cleansing agent. These nozzles are connected to lines, not shown, in which the flow is controlled by a magnetic valve 20c. Slots 27 which are connected to boxes 28 for hot air fastened to the rear surface of the wall 2, are recessed in the wall 2 above the nozzles 25, 26.

35 The magnetic valves can be controlled by electrical control means, fitted in a box 23, specifically control means for regulating the magnetic valve 20a, control means for regulating the magnetic valve 20b and control means for regulating the

magnetic valve 20c.

An infrared detection apparatus 24 which can detect the presence of a hand at the front face of the wall 2 in the vicinity of the apparatus 24 is fastened to the rear surface of the wall 2. In this section, the front face is provided with a pictogram representing a hand. After use of the toilet, the bowl can be flushed by bringing a hand near this pictogram. The apparatus 24 emits a signal to control means in the box 23 which open the magnetic valve 20a and close it after a certain period of time. If the user of the toilet does not perform the necessary manipulations for flushing the bowl provisions are made for flushing the bowl nevertheless. On opening and closing of the sliding door 5 a door-locking switch 41 emits a signal to the control means in the box 23. As soon as these means have received a signal for opening and/or closing the door, the magnetic valve 20a in the line to the flushing device 11 is opened and the bowl flushed. The possibility is not excluded that these control means are programmed such that the flushing takes place, as a result of the opening and/or closing of the sliding door 5, only if flushing has not been done by bringing a hand near the said pictogram. The possibilities also include the fact that the toilet bowl is flushed every time the door is opened independent of whether the bowl has been flushed by bringing a hand near the pictogram.

The equipment cubicle contains an infrared detection system 29 for detecting the presence of a subject in the usage cubicle. This system comprises, for example, four infrared detectors. A number of these can be accommodated in the boxes 28. The control means for the control valves 20b and 20c in the supply lines to the nozzles 18, 19, 25, 26 open these valves if it is detected that a subject has left the cabin. There may possibly be a time difference between the cleaning-of-the-toilet bowl edge and the cleaning of the floor. All this can be refined by electrically locking the sliding door 5 during the cleaning of the floor, by means of the switch 41, cleaning not starting until the switch 41 is indeed locked.

Hot air is supplied via the slits 20 and 27, respectively after flushing of the toilet bowl and cleaning of the edge of the bowl and of the floor. The supply of hot air to the boxes 22, 28 is activated for this purpose by control means which are likewise arranged in the box 23. Time switches present in the box 23 can ensure that cleaning of the toilet bowl edge, cleaning of the floor and drying take place successively. For example, 2 1/2 minutes are available for the complete procedure.

A detection apparatus 30 for detecting the presence of a hand or the like is present near the water tap 10 in the equipment cubicle. As soon as a hand is present near that apparatus the water

starts to run and the water supply stops when the hand is removed.

The heating apparatus for the hand dryer 13 is indicated by 31 and is present in the equipment cubicle. The presence or absence of a hand near the dryer 13 can be established by operating radar 32 and the dryer switched on if necessary.

An electric air-heating apparatus 33 which is regulated by a thermostat 34, and, at a certain air temperature, can blow hot air into the usage cubicle via the slits or the grid 35, is present in the equipment cubicle. The apparatus can consist of a separate heating system and a separate fan.

Electrical heating elements 36 regulated by a floor thermostat 37 are arranged in the floor.

Elements 38, 39, 40 which - when illuminated - can indicate whether the toilet is engaged by a subject, is vacant, and/or whether the floor of the toilet is being washed, are present above the entrance door.

An emergency illumination element 42 is present at a place, which is difficult to reach, behind a solid grid. This element is fed by an emergency illumination unit in case of failure of the electrical current.

Various modifications are possible within the scope of the invention. It is important for the inventive concept that no sensitive, movable parts are arranged in the usage cubicle and that the provisions made for flushing the toilet bowl and for cleaning the edge of the bowl and the floor are essentially not accessible from the usage cubicle. Furthermore, the flushing and cleaning are progressively controlled such that contamination is impossible and subjects do not run a risk of damage to clothing by cleansing liquid. It is furthermore necessary for the cabin and the partition to consist of a corrosion-resistant, non-porous material. Various other provisions can of course also be arranged in the usage cubicle, such as a small seat for children, a drain for cleansing liquid. The entrance door to the usage cubicle can always be brought automatically into the closed position by means of a counterweight. The entrance door to the equipment cubicle will be capable of being locked and unlocked by means of a transmitter/receiver system. There is the possibility that the entrance door to the usage cubicle is locked automatically at certain times, for example at night between 1 and 7 am.

#### Claims

1. Toilet for public use comprising a cabin (1) which is divided by a partition (2) into a usage cubicle (3) having a door (5) to be locked from the inside and an equipment cubicle (4), a toilet bowl

(7) being placed in the usage cubicle, which toilet bowl is provided with a flushing device 11 connected to a fluid-carrying line in which is mounted a regulating valve (20a) which can be opened and closed by control mean, characterized in that a number of nozzles (18, 19; 25, 26) for cleaning the toilet bowl ledge and/or the floor of the usage cubicle open into the usage cubicle, these nozzles being connected to fluid-carrying lines having regulating valves (20b, 20c) which can be opened and closed by control means, and that first detection means (29) such as radar or infrared beams which are not accessible from the usage cubicle and can detect the presence and absence of a subject in the usage cubicle are placed in the equipment cubicle, these detection means being connected to the control means, all this such that the valves (20b, 20c) in the fluid-carrying lines to the nozzles (18, 19; 25, 26) can be opened only if it is detected that somebody has been present in the usage cubicle and has left the latter.

2. Toilet according to Claim 1, characterized by a door-locking mechanism (41) connected to the control means, all this such that the locking mechanism is brought into the locked position if it is detected that somebody has been present in the usage cubicle and has left the latter.

3. Toilet according to Claim 1 or 2, characterized in that second detection means (24) which are not accessible from the usage cubicle, are connected to the control means and can detect the presence of a hand, foot or the like near a given part of the wall or floor, are present in the equipment cubicle, all this such that the said valve (20a) in the fluid-carrying line of the flushing device (11) of the toilet bowl is opened if the second detection means have detected the presence of a hand, foot or the like near the said wall part.

4. Toilet according to Claims 2 and 3, characterized in that the control means open the valve (20a) in the fluid-carrying line of the flushing device (11) if it is detected that somebody has been present in the usage cubicle and has left the latter without having operated the second detection means (24).

5. Toilet according to Claim 4, characterized in that the control means open the valve (20) in the fluid-carrying line of the flushing device (11) of the toilet bowl during each locking of the door-locking mechanism (41).

6. Toilet according to one of the preceding claims, characterized in that the cabin walls with the partition consist of a non-porous, corrosion-resistant material.

5  
7. Toilet according to Claim 6, characterized in that the cabin walls and the partition consist of a sandwich formed from a core of plastic foam covered on either side with a hard smooth layer of polyester and/or polyurethane.

10  
8. Toilet according to one of the preceding claims, characterized in that the toilet bowl (7) forms an integral with the partition (2) and has no moving parts.

15  
9. Toilet according to one of the preceding claims, characterized by means (21, 22; 27, 28) for supplying warm air to the toilet bowl edge and/or floor and control means for activating the warm air supply means when the cleaning of the toilet bowl edge and/or toilet floor is finished.

20  
10. Toilet according to one of the preceding claims, characterized by a wash basin (9), a water-supply nozzle (10) near the wash basin, means, fitted in the equipment cubicle, for supplying water to said nozzle, third detection means (29) for detecting a hand near the nozzle (10) and activating the said water supply if the presence of a hand is detected.

25  
11. Toilet according to one of the preceding claims, characterized by a soap dispenser (12).

12. Toilet according to one of the preceding claims, characterized by a toilet-paper holder (18), fitted in the equipment cubicle, having an opening (15) for feeding through paper in the partition (2).

30  
13. Toilet according to one of the preceding claims, characterized by an air-heating unit (33) fitted in the equipment cubicle, air vents (35) in the partition (2), a fan for blowing air around the heating unit via the air vents into the usage cubicle, and a thermostat control (34) for switching on the air-heating unit at a certain air temperature.

35  
14. Toilet according to one of the preceding claims, characterized by a floor heating system (36)-controlled-by-a-thermostat (37).

40  
15. Toilet according to one of the preceding claims, characterized in that illuminated indicating elements (38, 39, 40) which indicate whether the toilet is vacant or engaged or that the toilet is being cleaned, are arranged near the door of the usage cubicle.

Fig - 1

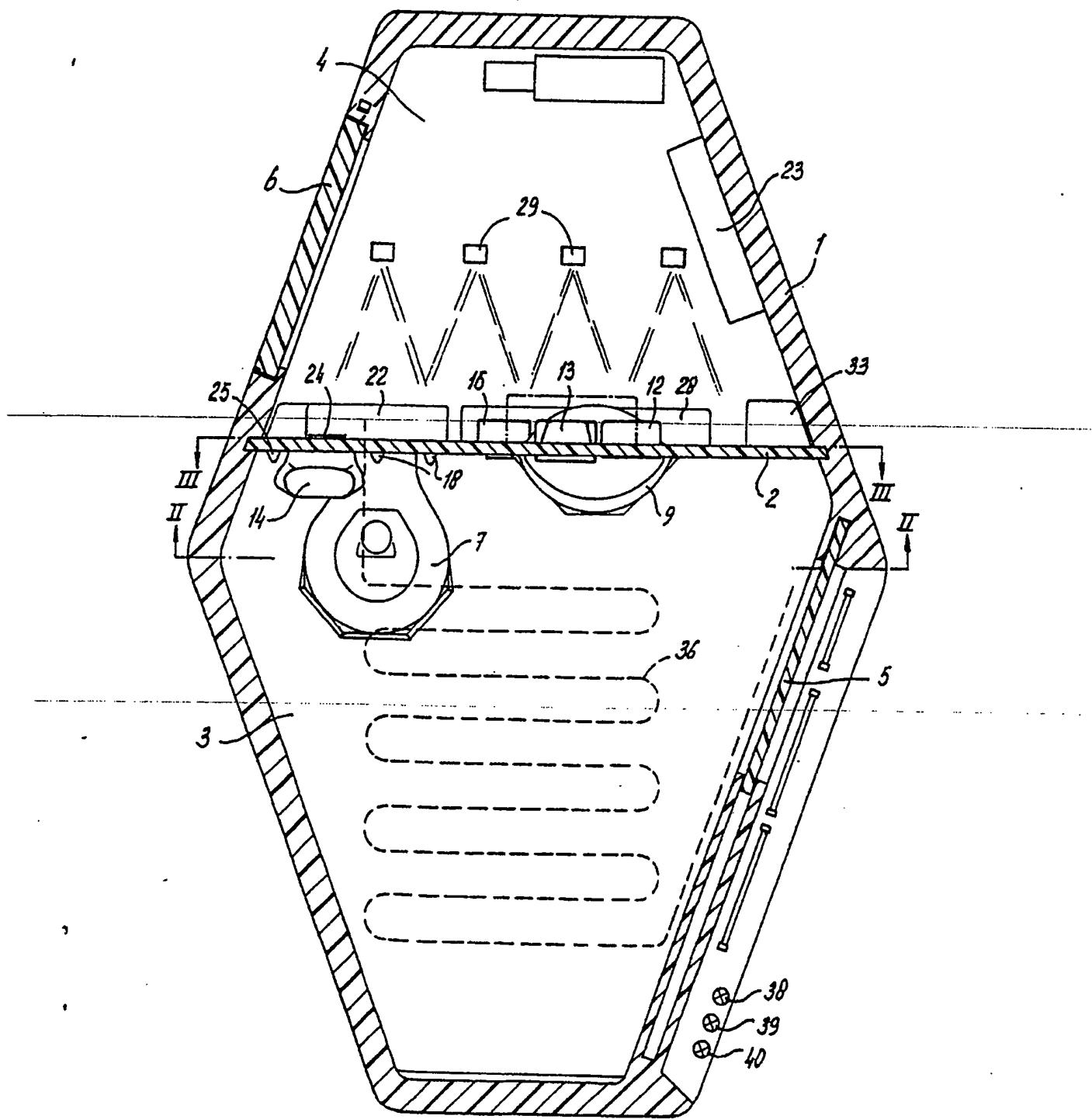


fig-2

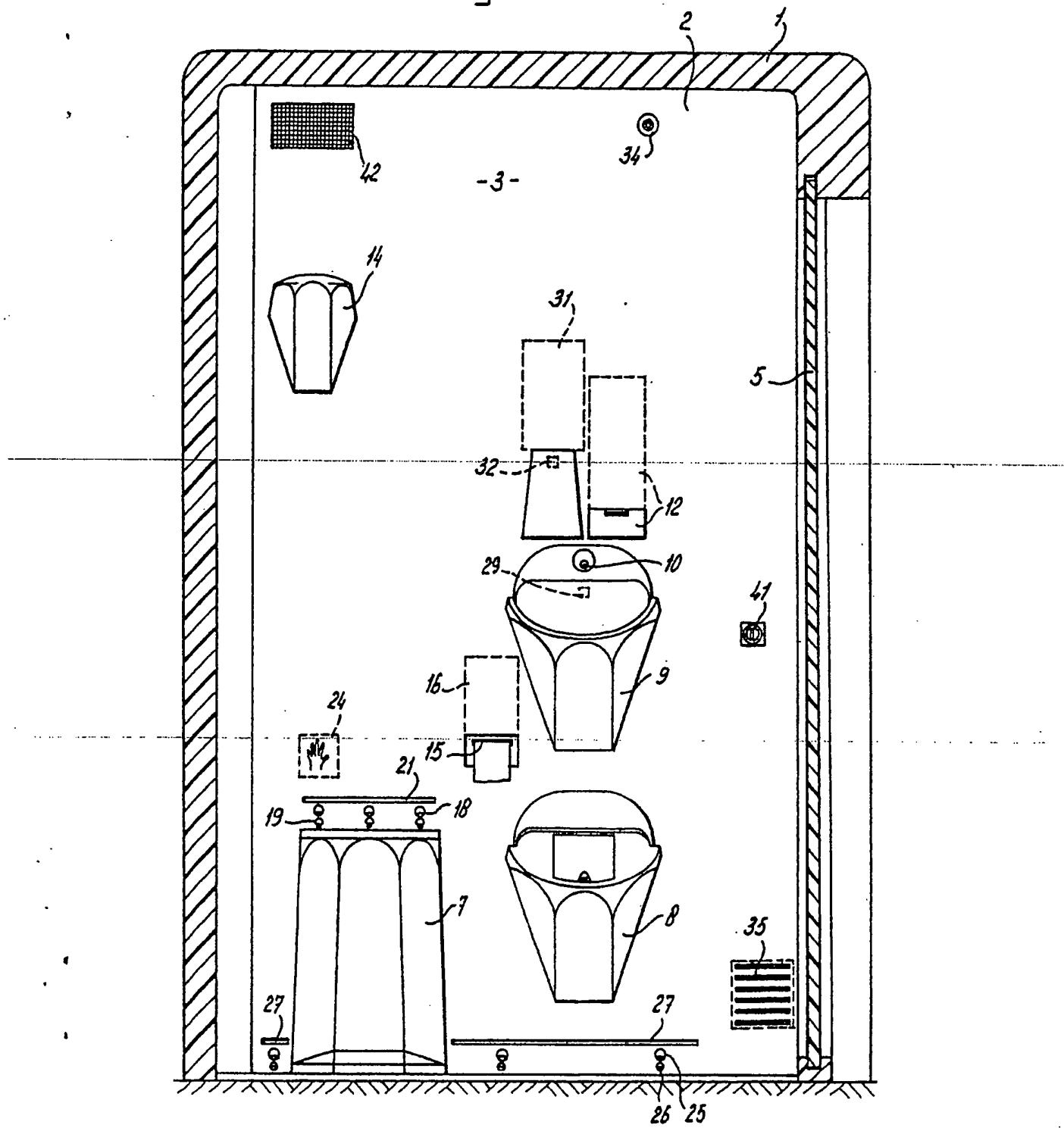
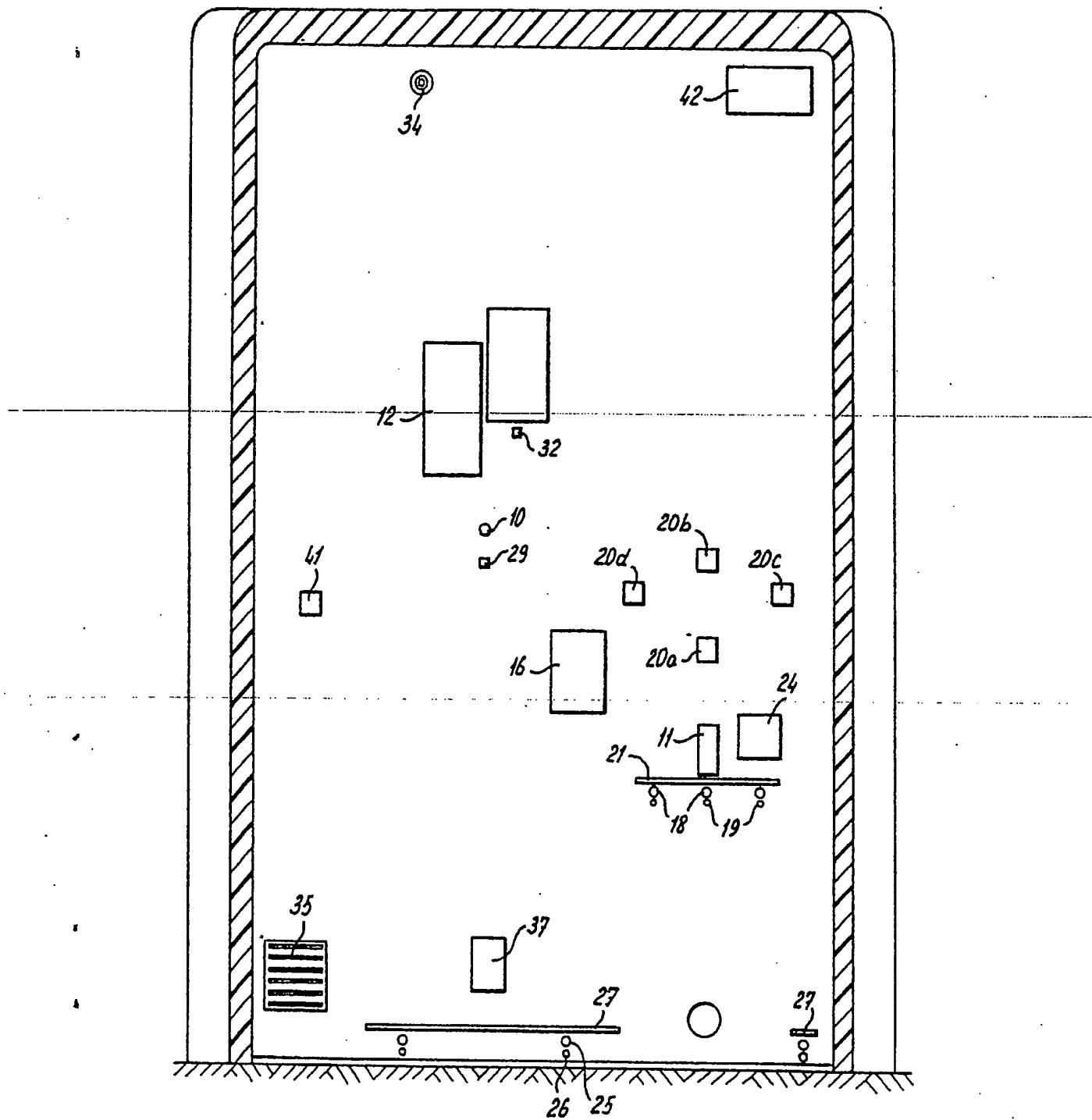


fig - 3





## EUROPEAN SEARCH REPORT

Application Number

EP 87 20 2469

## DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claims	CLASSIFICATION OF THE APPLICATION (Int. CL.4)
			TECHNICAL FIELDS SEARCHED (Int. CL.4)
Y	EP-A-0 180 236 (TOTO LTD) * Page 6 - page 15, line 7; figures 1-10; claims *	1,8	E 03 D 9/00 A 47 K 4/00
A	---	3-5	
Y,D	US-A-4 233 692 (SINSLEY) * Column 2, lines 3-6; column 3, line 61 - column 4, line 48; figures 1-6 *	1,8	
A	---	3-6	
A,D	US-A-2 688 141 (FILLIUNG) * Whole document *	2	
A	GB-A-2 123 046 (ICA S.p.A. INDUSTRIA COMPONENTI PER L'ARCHITETTURA) * Page 1, lines 15-21; page 2, lines 32-39; figure 1; claims *	12	
A	US-A-3 755 826 (ROBERTS) * Column 2, lines 60-68; claims; figures *	1	
A	EP-A-0 059 134 (VERGNES) ---		E 03 D A 47 K
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	21-03-1988	HANNAART J.P.	
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